Chapter 14 Contents

List if Figures

14. LIGHTING

This chapter provides information on the various procedures and policies required for lighting future new construction and reconstruction projects and permitted lighting features on the state highway system in Georgia. It is not intended that existing lighting systems be modified as a result of the criteria outlined in this policy.

GDOT has adopted the current edition of the American Association of State Highway and Transportation Officials (AASHTO) policy *Roadway Lighting Design Guide* for the state of Georgia. The remainder of this policy document will address items not included in the AASHTO guide or provide clarification or emphasis on included items.

There are many reference publications that are available to the lighting designer, including but not limited to: AASHTO, Federal Highway Administration (FHWA), and the Illuminating Engineering Society of North America (IESNA) provide the most engineering information and knowledge in their handbooks and guides with regard to lighting design.

Standard definitions of terms for lighting can be found in the AASHTO design guide. Refer to the **References** section of this manual for details on how to obtain these and other lighting reference publications.

14.1. General Considerations

The Georgia Department of Transportation (GDOT) is generally responsible for providing lighting on state highways for the following purposes:

- roadway (corridor, and intersection/roundabouts)
- interchange
- tunnel (roadway, and pedestrian/multi use)
- underpass
- pedestrian (sidewalks, multi use paths, and streetscape)
- parking facilities (welcome centers, rest areas, truck weigh stations, and park and ride lots)
- aesthetics (enhancement projects, bridges, etc.)
- sign structures – illumination of sign structures will be handled by the GDOT Office of Traffic Safety and Design and is not addressed in this document.

14.1.1. Roadway Lighting Warrants

It is best that lighting requirements be coordinated at the concept stage. All lighting requirements for existing or proposed systems shall be coordinated with the Roadway Lighting Group of the GDOT Office of Road and Airport Design.

Lighting should be considered for all Interstate projects (roadway and/or interchange), especially in urban areas, and be included in any interstate and or interchange upgrade project, assuming the local government will agree to the energy and maintenance costs for the newly installed system.

If while reconstructing existing roadways and/or adding lanes the proposed construction work does not conflict with existing roadway lighting structures, the new lane configuration still requires that the photometrics be evaluated based on current AASHTO and IESNA requirements. The majority will require a new lighting system to be provided. In addition, the lifespan of the major lighting system components (towers, poles, luminaires etc.) is typically 20 to 25 years. Retaining components longer can greatly increase the maintenance requirements of the lighting system.

If an existing roadway lighting system is present and requires relocation, upgrade or replacement, then the required work for the lighting system will be included in the GDOT roadway project. The responsible Local Government shall continue to pay for Energy, Maintenance and Operations of the system. GDOT shall retain the ownership of the system.

If no existing roadway lighting system is present **AND** the site does not meet the AASHTO warranting conditions for roadway lighting, **THEN** a written request for lighting must come from the Local Government for the inclusion of roadway lighting to be included in a programmed GDOT project to be considered.

GDOT will include lighting with roadway projects or assist in the funding of lighting projects if requested by the local government and the local government will agree to the long term energy, maintenance and operations costs.

14.1.2. Roadway Lighting Agreements

A lighting agreement and/or permit shall be required for all lighting facilities placed on GDOT's right of way.

The Roadway Lighting Group prepares all lighting agreements for lighting included in all Let and Force Account projects. They also keep GDOT's archives for lighting agreements dating back to the late 1960's. Any inquiries to the existence of or the need for a new lighting agreement should be forwarded to the Roadway Lighting Group.

The Office of Utilities will review all lighting permits as well as keeping the GDOT archives for all lighting permits. Any inquiries to the existence of a lighting permit should be forwarded to the Office of Utilities. For projects that have no GDOT funding, refer to **Section 14.1.4**. of this Manual.

Lighting Agreements are not required for lighting GDOT owned and operated facilities such as welcome centers, rest areas and truck weigh stations.

The Project Manager should coordinate through the Roadway Lighting Group for a local government lighting agreement or for any lighting requirements associated with their projects.

Lighting agreements typically involve one local government, but multiple local governments may be involved (i.e. County and City). The physical location of the lighting system does not necessarily have to be within the jurisdictional area of the responsible local government. A local government may request to be responsible for a lighting system that is outside of their respective jurisdiction.

Lighting Agreements are site specific, **NOT** construction project specific. Lighting Agreements cover a 50 year time period. This allows the Department to retouch the site multiple times without acquiring a new lighting agreement until such time that the agreement expires. Example: If the original agreement covered roadway lighting for a specific Interchange and GDOT reconstructs that Interchange and the proposed new lighting system matches the verbal description of the original agreement then no new agreement is required. But if the new project extends the coverage by

adding additional roadway lighting along the roadway (down mainline or crossroad) and no longer matches the verbal description in the existing agreement, then a new agreement would be required.

14.1.3. GDOT Assistance in Funding

When GDOT and a Local Government enter into an Agreement to provide a roadway lighting system the project can be funded and constructed in accordance with one of the five basic scenarios of lighting projects. The four scenarios that include GDOT funding at various levels of participation are as follows:

Scenario 1 – Lighting system included in a GDOT let roadway or maintenance project

- Request for lighting assistance is received from the corresponding Local Government(s)
- **and** GDOT has an existing programmed project to which the work can be added
- **and** Local Government(s) sign a lighting agreement to pay for the energy, maintenance and operations of the lighting system
- Then the work is added to the GDOT project at no cost to the Local Government for design, materials and installation
- GDOT shall retain ownership of the lighting system
- This is the preferred scenario of GDOT

Scenario 2 – Lighting system included in a stand-alone force account lighting project

- Request for lighting assistance is received from the corresponding Local Government(s)
- **and** GDOT does **NOT** have an existing programmed project to which the work can be added
- **and** the site is on the National Highway System
- **and** a *Cost Justification Report* is provided showing it is more cost effective to install the lighting system via local government forces versus a Let project
- **and** the Local Government(s) sign a lighting agreement agreeing to be responsible for the design, installation, energy, maintenance and operations of the lighting system.
- Then a Stand-alone Force Account project can be set up with the Department being responsible for the funding of materials only
- GDOT shall retain ownership of the lighting system
- This is the second most commonly used scenario

Scenario 3 – Lighting system included in stand-alone local government-let lighting project

- Request for lighting assistance is received from the corresponding Local Government(s)
- **and** GDOT does **NOT** have an existing programmed project to which the work can be added

- **and** the site is on the National Highway System
- **and** the Local Government(s) sign a lighting agreement agreeing to be responsible for the design, installation, energy, maintenance and operations of the lighting system
- Then a Stand-alone Local Government Let project can be set up with the Department being responsible for the **funding of materials only**
- GDOT shall retain ownership of the lighting system

Scenario 4 – Lighting system included in stand-alone GDOT-let lighting project

- Request for lighting assistance is received from the corresponding Local Government(s).
- **and** GDOT does ***NOT*** have an existing programmed project to which the work can be added.
- **and** the Local Government(s) sign a lighting agreement agreeing to be responsible for the **energy, maintenance, and operations** of the lighting system.
- **and** approval is received from GDOT Management.
- Then a Stand-alone Let GDOT project can be set up at no cost to the Locals for design, materials and installation
- GDOT shall retain ownership of the lighting system
- This scenario is used on a very limited basis and is for extreme circumstances approved on a case by case basis only

14.1.4. No GDOT Assistance In Funding

In the event that GDOT will not be assisting in the funding, then a Utility Lighting Permit may be issued by GDOT with the Local Government or applicant being responsible for 100% of all associated costs while still meeting all state requirements for lighting design. The Department shall review and approve the plans. The Local Government or applicant retains ownership of the system under the following scenario. The scenario that includes no GDOT funding is as follows:

Scenario - Utility Permit to Local Government or applicant for Lighting Roadway

All lighting permits that are requesting to place lighting facilities on GDOT right of way are to be applied through appropriate District Utilities Office. The District Office will review and determine exactly what type of Lighting Permit has been received. There will be four different guidelines or types as follows:

- **Residential Lighting** – Consisting of 1 or 2 luminaires only for purpose of lighting private property utilizing existing pole facilities. Applicant is paying for entire cost. District Utilities Office will review electrical hookups and District Traffic Operations Office will review the height of lights and position. Once reviewed and accepted by both the District Utilities and the District Traffic Operations offices, the District Engineer will approve the utility permit via the District Utilities Office. A copy shall be sent to the State Utilities Office.
- **Business Lighting** – Consisting of 2 or more luminaires on existing pole facilities for the purpose of lighting private property with the Local Government or Applicant paying for entire

cost. District Utilities Office will review pole/light standard locations and electrical hookups and District Traffic Operations will review the height of lights and position. Once reviewed and accepted by both the District Utilities and the District Traffic Operations offices, the District Engineer will approve the utility permit via the District Utilities Office with a Special Provision that the Local Government or Applicant will design and construct the lighting in accordance with this Manual.

If the request consists of 2 or more luminaires, on new pole facilities, for the purpose of lighting private property with the Local Government or Applicant paying for entire cost then the District Utilities Office will review pole/light standard locations and electrical hookups and District Traffic Operations will review the height of lights and position. The State Utilities Office will develop a Memorandum of Lighting Agreement to be signed by both parties (Local Government or Applicant and GDOT Management) before the utility permit can be approved. Once reviewed and accepted by both the District Utilities and District Traffic Operations offices and signatures have been received by the State Utilities Office, the District Engineer will approve the utility permit via the District Utilities Office with the Memorandum of Agreement attached. A complete copy of the approved utility permit (including the Memorandum of Agreement) shall be forwarded to the State Utilities Office. The State Utilities Office will forward a copy to the Roadway Lighting Section of the Office of Road and Airport Design.

- **Governmental Lighting (Minor)** - Consisting of a request to light a section of a state route that is not located on the National Highway System and the Local Government or Applicant is paying for the entire cost of the lighting system with no more than 4 luminaires. District Utilities Office will review pole/light standard locations and electrical hookups and District Traffic Operations Office will review the height of lights and position. State Utilities Office will develop the Memorandum of Lighting Agreement to be signed by both parties (Local Government or Applicant and GDOT Management) before the utility permit can be approved. Once reviewed and accepted by both the District Utilities and District Traffic Operations offices and signatures have been received by the State Utilities Office, the District Engineer will approve the utility permit via the District Utilities Office with the Memorandum of Agreement attached. A complete copy (including the Memorandum of Agreement) of the approved utility permit shall be forwarded to the State Utilities Office. The State Utilities Office will forward a copy to the Roadway Lighting Section of the Office of Road and Airport Design.

- **Governmental Lighting (Major)** - Consisting of a request to light sections of a state route that is not located on the National Highway System and the Local Government or Applicant is paying for the entire cost of the lighting system with 5 or more luminaires. District Utilities Office will review pole/light standard locations and electrical hookups and District Traffic Operations Office will review the height of lights and position. State Utilities Office will develop the Memorandum of Lighting Agreement to be signed by both parties (Local Government or Applicant and GDOT Management) and forward the complete permit package to the Roadway Lighting Section of the Office of Road and Airport Design for the review of the lighting plan. Once reviewed and accepted by all three Offices and signatures have been received in the State Utilities Office; the District Engineer will approve the utility permit via the District Utilities Office, with the Memorandum of Agreement attached. A complete original copy of the approved utility permit shall be forwarded to the State Utilities Office. The State Utilities Office will forward a copy to the Roadway Lighting Section of the Office of Road and Airport Design.

14.1.5. Roadway Lighting Plan Preparation

The Office of Road & Airport Design's Roadway Lighting Group shall coordinate the preparation of lighting plans for all Let and Force Account projects for but is not limited to the following:

- road design
- urban design
- consultant design
- all district offices
- Office of Maintenance
- other State agencies (i.e. Jekyll Island Authority)
- Local Governments (County and City)

Lighting plans shall not be developed until after an executed lighting agreement is in place.

All roadway lighting must be included GDOT's environmental evaluation processes. Most stand-alone lighting projects are handled with a Categorical Exclusion (CE) Environmental Document. This applies to Let or Force Account projects.

For roadway projects that lighting is added to after the Environmental Document has been prepared, coordination with GDOT's Office of Environment/Location (OEL) is needed to ensure there are no historical or environmental conflicts. NEPA clearance can take up to 6 months to acquire dependent on the sensitivity of the site. Some examples of environmental and historical conflicts that can affect roadway lighting are:

- **Endangered species:** Sea turtles in coastal regions.
- **Archeological conflicts:** Indian mounds and other archeologically significant sites.
- **Historic resources:** Light trespass into historic districts or individual properties. Height restrictions adjacent to historic or individual properties.
- **Environmental conflicts:** Wetland impacts requiring directional bore in place of traditional trenching to run conduits. Possible restrictions as to the limits of vegetative clearing.

The preparation of lighting plans that are to be included in a parent set of roadway or maintenance plans should not be started until **AFTER** the PFPR comments have been implemented into the roadway plans. The horizontal and vertical alignments, bridges plans, drainage, proposed utility plans etc. need to be set before the lighting plans can be developed.

When requesting lighting plans for inclusion in parent project, a request must be sent to the Roadway Lighting Group with the following information:

- Confirmation of an executed Local Government Lighting Project Agreement (LGLPA) for the site (handled by request to the Roadway Lighting Group)
- Parent Project Number and PI Number
- Current Management Let Date
- Brief description of site and work to be covered by the lighting plans

- Proposed delivery date for Final Lighting Plans

The Roadway Lighting Group will prepare a scope and man hour estimate to include with each request for a Task Order Contract for lighting plans. After the Roadway Lighting Group has requested the Task Order and approval for the Task Order has been received; Program Delivery issues the Task Order through the Lighting Master Task Order Contract or through one of the general Master Task Order Contracts.

Once the design consultant has been selected the following information will be required from the Project Manager:

- CD with the DGN files for the plan view covering the area to be lighted (minimum 1,000-ft. before the exit ramp gores and 1,000-ft. beyond the entrance gores along the interstate if interchange lighting).

- Full-size hardcopy set: cover, typical sections, plan, profile, drainage cross-sections/profiles, bridge plan and elevation (for all bridges located within the proposed lighting boundaries) and proposed utility plans.

14.2. Types of Lighting Projects

Prior to the design of a lighting system, the designer must determine the project type and the particular location where lighting may be warranted. The following types of lighting projects are included and their design requirements discussed further in this chapter:

- roadway lighting
- interchange lighting
- truck weigh stations
- tunnels and underpass
- park and ride lots
- rest areas and welcome centers
- pedestrian and security lighting

14.3. Illumination Requirements

If lighting is included in the project then the design shall be based upon AASHTO and IESNA guidelines, the designer should then determine the uniformity ratios and Light Loss Factors (LLF) for each specific lighting project. For roadways, tunnels, rest areas, welcome centers and park &ride lots, the guidance is as follows:

14.3.1. Roadway

The roadway maintained average illuminance, uniformity ratio and veiling luminance ratio shall be in accordance with the AASHTO Roadway Lighting Design Guide and the IESNA RP-8. A LLF of 0.7 shall be used to compute the maintained illuminance values. The lighting designer may use a lower LLF if necessary but the designer shall document the reasons in the lighting calculations.

14.3.2. Vehicular Tunnels

The maintained average luminance values in the tunnel threshold and interior zones shall be in accordance with the AASHTO Roadway Lighting Design Guide and the IESNA RP-22. A LLF of 0.5

shall be used to compute the maintained luminance values. The lighting designer may use a lower LLF if necessary but the designer shall document the reasons in the lighting calculations.

14.3.3. Rest Areas and Welcome Centers

The maintained average illuminance values for the parking and pedestrian areas shall be in accordance with the AASHTO Roadway Lighting Design Guide and the IESNA G-1. A LLF of 0.7 shall be used to compute the maintained illuminance values. The lighting designer may use a lower LLF if necessary but the designer shall document the reasons in the lighting calculations.

14.3.4. Park & Ride Lots and Pedestrian Tunnels

The illuminance values for pedestrian tunnels shall be in accordance with IESNA G-1. A LLF of 0.7 shall be used to compute the maintained illuminance values.

14.4. Lighting Calculations

As part of the steps for determining the appropriate lighting system for a particular project, the lighting designer must calculate the required illumination. Various factors are considered when making this determination, such as roadway width, lighting setback and mounting height, and the type of lighting system to be used. The designer determines the lighting calculations for a particular project by using a computer program, such as AGi32 by Lighting Analysts, Inc. The calculation shall show illuminance values on the roadway with point to point intervals of 6 ft. longitudinally and transversely. Also, when a section of roadway is being analyzed, the entire section of roadway that is being illuminated shall be analyzed completely as a self-contained area.

The lighting calculations shall show the tabulated values for average, minimum and maximum footcandles, uniformity and veiling luminance ratios. The lighting designer shall submit files of the complete roadway or area under consideration with point by point illuminance values in Adobe Acrobat (.pdf) format. It may be necessary for the lighting designer to consider other lighting options and to substantiate that the lighting design is optimum and cost effective. The lighting designer shall be prepared to explain the lighting system choice and present all documentation to GDOT to substantiate the lighting recommendation.

14.5. Design Considerations

This section provides guidance to the lighting designer with regard to roadways, interchanges, truck weigh stations, tunnels and underpasses, rest areas, welcome centers, park & ride lots, and pedestrian and security lighting. These design considerations, along with the lighting designer's experience and engineering knowledge of lighting design, should prove valuable in determining the most appropriate lighting system for each project.

14.5.1. Standard Location Guidance

See **Chapter 5, Roadside Safety and Horizontal Clearance**, of this manual for locating light standards and high mast towers. In addition, light standards and high mast towers shall also be located to provide proper clearances from utility lines, airport glide paths, railroads, etc. The lighting designer shall ensure that the design is coordinated with other utility features.

14.5.2. Luminaires

All luminaires shall be high pressure sodium and be in accordance with GDOT's Qualified Products List (QPL) and standard specifications. High mast luminaires with Type V symmetrical distribution is preferred. Other distributions may be used to accomplish proper roadway illumination or to avoid

spillage on adjacent properties. Cut-off optics shall be used for both high mast and conventional luminaires if required by project specific issues.

14.5.3. Electrical Materials

All electrical materials, such as conduit, cables, wires and junction boxes, shall be new U.L. listed and meet the requirements of the National Electrical Code, and the American National Standards Institute. Electrical conduits, wires, circuit breakers, fuses, ground rods and ground conductors shall meet GDOT's Standard Specifications and shall be in accordance with GDOT's Qualified Products List (QPL).

14.5.4. Roadway Lighting

Continuous roadway lighting generally uses conventional lighting systems consisting of high pressure sodium offset type luminaires. The use of mast arms with cobra head luminaires is discouraged and shall require approval on a case by case basis. The nominal mounting height shall be 30-ft. to 50-ft. The luminaries shall be 150W, 250W, or 400W depending on the roadway geometry and mounting heights. Lighting standards may be placed on one or both the sides of the highway either opposite each other or staggered. The lighting standard setback measured from the face of a non-mountable curb or edge of pavement to the centerline of the lighting standard shall be 5-ft. 6-in. minimum.

Lighting standards located inside the clear zone shall be provided with AASHTO compliant breakaway transformer bases or breakaway couplings and breakaway wiring connectors unless shielded by a barrier. The lighting standards may also be located on the median barrier wall with specific approval from GDOT. GDOT will ensure that the maintenance on these luminaires will not pose an unacceptable level of safety or an unacceptable level of service if lane closures are required for lighting maintenance. Offset type luminaries with very short mast arms may be used for median barrier wall mounted lighting standards.

Where it is more cost effective to do so, high mast lighting may be used for roadway lighting.

14.5.5. Interchange Lighting

High mast lighting shall be used for interchange lighting unless the location has constraints on the pole height such as near airport boundaries. Conventional lighting may be used in the areas determined to have height constraints.

At interchanges, the high mast poles shall have 100-ft. nominal mounting height. The high mast luminaries should be 1,000 Watt. Lower wattage luminaires may be utilized if satisfactory justification is first provided to GDOT. The lighting designer shall provide an optimum and cost effective lighting design for GDOT's approval.

High mast lighting shall be provided to cover a minimum of 1,000-ft. from the farthest gore point on exit/entrance ramp. High mast lighting shall be provided to cover the distance to the point where the travel lane and taper is 12-ft. but shall not be less than 1,000-ft. from the gore point. (see **Figure 14.1. Example of a Lighting Gore Detail**). High mast luminaries with type V symmetrical distribution are preferred. Other types of light distributions may be used to accomplish proper roadway illumination or to avoid spillage on adjacent properties up to and including the use of offset luminaires.

Shields shall be used to control light spillage on residences or other areas where the spilled light may be considered objectionable. The lighting designer needs to consider this type of impact to surrounding areas and land uses when developing the proper lighting system.

For high mast pole foundations, design analysis shall be performed. Soil borings shall be done at each proposed location of the high mast pole and the results used in the foundation design. The high mast pole foundation design shall be approved by the GDOT Office of Bridge Design prior to installation. High mast light poles located on a 2:1 or greater slope shall be provided with maintenance platforms.

All underpasses within the illuminated limits of the interchange shall maintain the same illuminance levels as the adjacent roadway. This may require the installation of underpass luminaires.

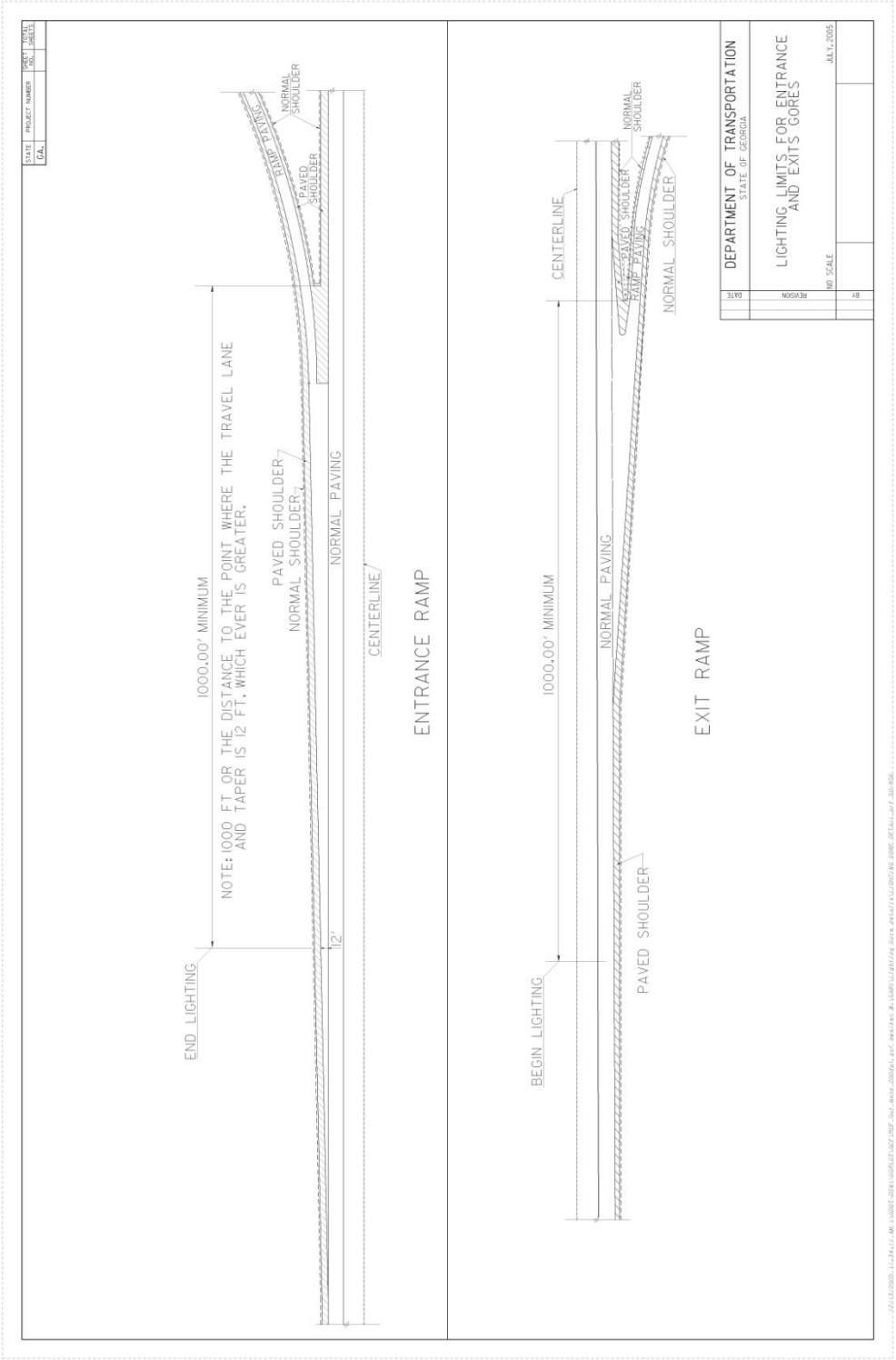

Figure 14.1. Example of a Lighting Gore Detail

14.5.6. Truck Weigh Stations

The truck weigh station shall be provided with a High Mast lighting system similar to the system described for interchange lighting. The entrance and exit ramps to the truck weigh station shall be provided with conventional lighting. See **Section 14.5.5**. of this Manual for the requirements of the limits of lighting coverage for the ramps.

14.5.7. Vehicular Tunnels

The reflective characteristics of pavement, wall and ceiling materials shall be taken into account for computing roadway luminance values. The lighting designer shall also take into account daylight penetration into the tunnel.

The luminaires shall preferably be mounted on the ceiling of the tunnel or shall be wall mounted. Specific approval shall be obtained from GDOT for ceiling mounting the luminaries. GDOT will ensure that the maintenance on these luminaires will not pose an unacceptable level of safety or an unacceptable level of service if lane closures are required for lighting maintenance.

14.5.8. Rest Areas and Welcome Centers

The lighting for rest areas, welcome centers, and Park & Ride lots shall meet the requirements of IESNA RP-20 and G-1. Conventional lighting with high pressure sodium luminaires shall be used for all parking areas. High Mast Lighting shall be considered if the rest area or welcome center has large parking areas away from the buildings.

Post top high pressure sodium luminaires shall be used in the picnic areas of rest areas and welcome centers. Conventional lighting with high pressure sodium luminaires shall be used for entrance and exit ramps into these special areas off the main highway. See **Section 14.5.5**. of this Manual for the requirements of the limits of lighting coverage for the ramps.

14.5.9. Park & Ride Lots and Pedestrian Tunnels

Park & ride and pedestrian tunnels shall meet the requirements of IESNA G-1. All non tunnel mounted luminaires shall be full cut off or cut off HPS. All pedestrian tunnel luminaires shall be HPS and vandal proof. Cut-off optics shall be used if required by project specific issues.

14.5.10. Pedestrian and Security Lighting

The pedestrian and security lighting shall meet the requirements of IESNA G-1. Conventional lighting shall be used. The lighting designer should consider the use of vandal-resistant luminaires and other electrical equipment for particular types of security lighting.

14.6. Power Service

The lighting designer shall contact the power company and determine the availability of power service for lighting. A request shall be made to obtain the power service at locations desired by the lighting designer. The lighting designer shall provide the power company with information for estimated load at each service point location. A lighting site visit to meet with a power company representative may be necessary to coordinate power service for a roadway lighting project.

The lighting designer shall coordinate with the power company and the local government or jurisdiction responsible for paying the utility bills to determine if the power services will be metered.

If the local government enters into a contract with the power company to provide power at a fixed monthly charge, light metering will not be required.

The standard power services available from the power company are as follows:

- **Single phase – 3 wire**: 120/240V and 240/480V, the latter is preferred.
- **Three phase – 4 wire:** 480/277V. This power service is preferred when available for lighting projects with large loads.

The electrical power distribution design shall meet the National Electrical Code and local codes. The power company may want to provide lighting contactors and photocells to control the lighting when the power service is not metered. In this case, the lighting designer shall include lighting contactors and photocell in the design to control the unmetered lighting system.

All the electrical equipment, such as main circuit breakers, lighting contactors and load centers, shall be in NEMA-4X stainless steel enclosures that can be padlocked and shall be U.L. listed. A surge suppressor shall be provided at each power service. The surge suppressor shall be in NEMA-4X enclosure, UL1449 and UL1283 listed suitable for connection to the power service. The surge suppressor shall have a minimum surge current rating of 130,000A per phase and shall be provided with status indicating lights.

The electrical equipment and distribution system shall be designed to take into account any possible future expansion. The electrical equipment short circuit ratings shall exceed the available fault current. The lighting designer shall obtain the available fault current values from the power company.

The lighting designer shall size all the cables to limit the voltage drop to approximately 3.5%; and in no case more than a 5% drop in power service voltage. The voltage drop calculations shall be submitted to GDOT for approval.

The lighting designer shall include a diagram of each service point. See **Figure 14.2. Example of a Service Point Single Line Diagram,** for an example of format and content.

14.6.1. Grounding System

The ground rods shall be copper clad steel, minimum ¾-in diameter, 10-ft. long. The buried ground conductors shall be stranded copper. All the underground connections in the grounding system shall be made using exothermic weld (cadweld) process.

A ground rod shall be provided at each conventional light pole and connected in the pole base using a ground conductor. A ground grid consisting of four ground rods at the corners of the high mast lighting foundation shall be provided. The rods shall be connected to each other using #2 AWG stranded copper conductor to form a square ground grid. A #2 AWG bare stranded copper conductor shall be cadwelded to the grid and brought into the tower base to connect to the pole.

A ground grid consisting of three ground rods located at the apexes of a 10-ft. equilateral triangle and connected to each other using #2 AWG stranded copper conductors shall be provided at each power service. An adequately sized stranded copper conductor shall be connected to the ground grid and routed to main service disconnecting means. Appropriately sized insulated ground conductor(s) shall be provided in the conduits with the branch circuits

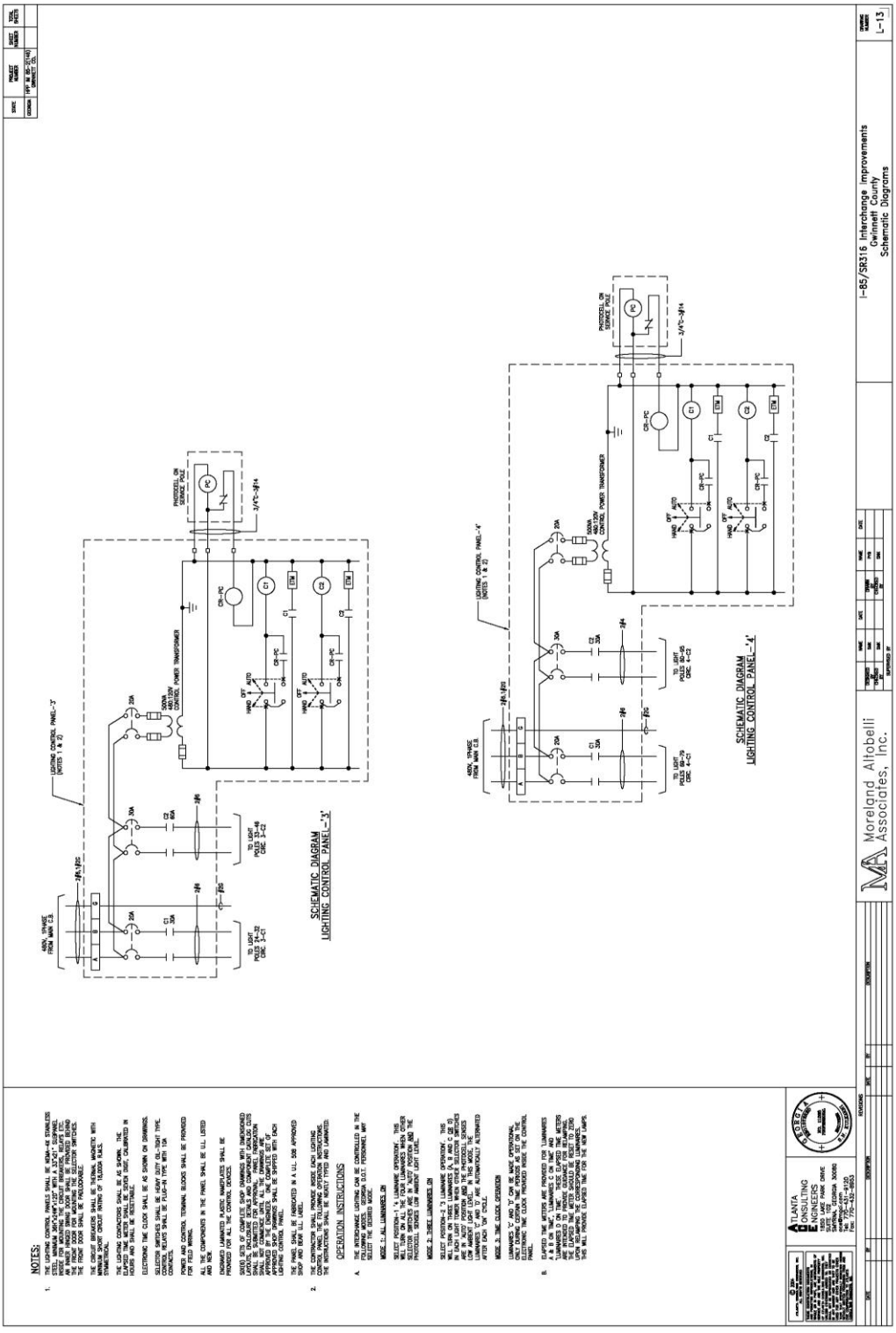

Figure 14.2. Example of Service Point Single Line Diagram

14.6.2. Photo Controls

All nighttime only lighting systems shall have a photocell control that operates independently of the power service provider controls.

Chapter 14 Index

Summary of Chapter 14 Revisions

February 12, 2009 Revisions	
14.1.4	Revised Government lighting(minor) and Governmental Lighting (Major) sections
14.5.2	Revised full cut off optics requirement. State type V distribution is preferred for high mast Luminaires.
14.5.9	Added the statement "Cut-off optics shall be used if required by project specific issues."